Ordering number:ENN5436A

NPN Epitaxial Planar Silicon Transistor

TS4162

VHF Band Low-Noise Amplifier and OSC Applications

Features

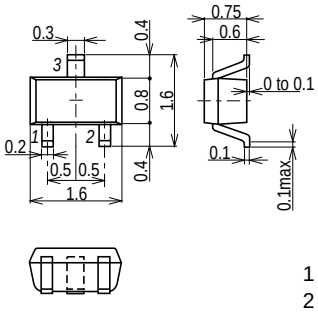
- Low noise : NF=1.8dB typ (f=150MHz).
- High gain : $|S21e|^2$=16dB typ (f=150MHz).
- Ultrasmall package facilitates miniaturization in end products

Package Dimensions

unit:mm

2106A

[TS4162]



1 : Base
2 : Emitter
3 : Collector
SANYO : SMCP

Specifications

Absolute Maximum Ratings at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	V_{CBO}		20	V
Collector-to-Emitter Voltage	V_{CEO}		12	V
Emitter-to-Base Voltage	V_{EBO}		2	V
Collector Current	I_C		50	mA
Collector Dissipation	P_C		100	mW
Junction Temperature	Tj		150	˚C
Storage Temperature	Tstg		–55 to +150	˚C

Electrical Characteristics at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	I_{CBO}	V_{CB}=10V, I_E=0			1.0	μA
Emitter Cutoff Current	I_{EBO}	V_{EB}=1V, I_C=0			10	μA
DC Current Gain	h_{FE} 1	V_{CE}=2V, I_C=3mA	80		200	
	h_{FE} 2	V_{CE}=2V, I_C=50mA	70			
Gain-Bandwidth Product	f_T	V_{CE}=2V, I_C=3mA	1.0	1.7		GHz
Output Capacitance	Cob	V_{CB}=10V, f=1MHz		1.1	1.8	pF
Reverse Transfer Capacitance	Cre	V_{CB}=10V, f=1MHz		0.8		pF
Forward Transfer Gain	$\|S21e\|^2$	V_{CE}=2V, I_C=3mA, f=150MHz	13	16		dB
Noise Figure	NF	V_{CE}=2V, I_C=3mA, f=150MHz		1.8	3.0	dB

Marking : MA

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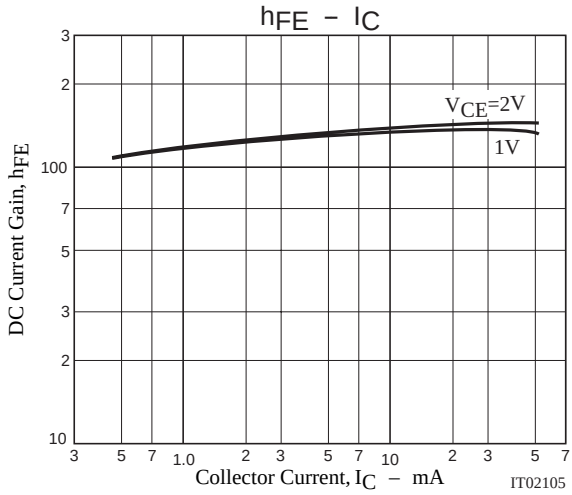
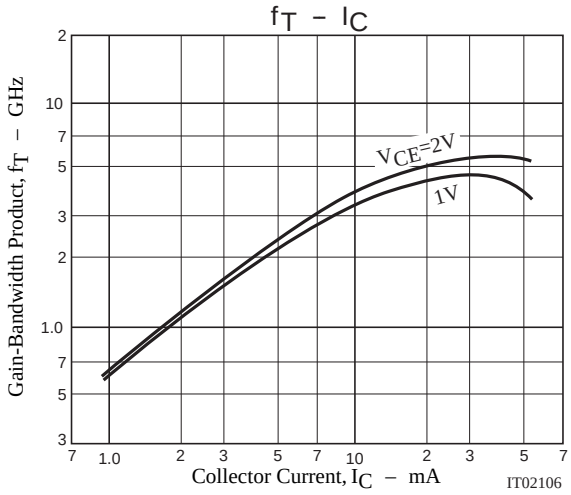
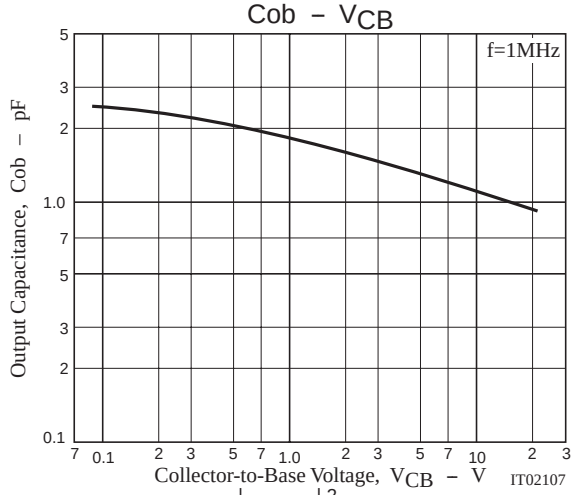
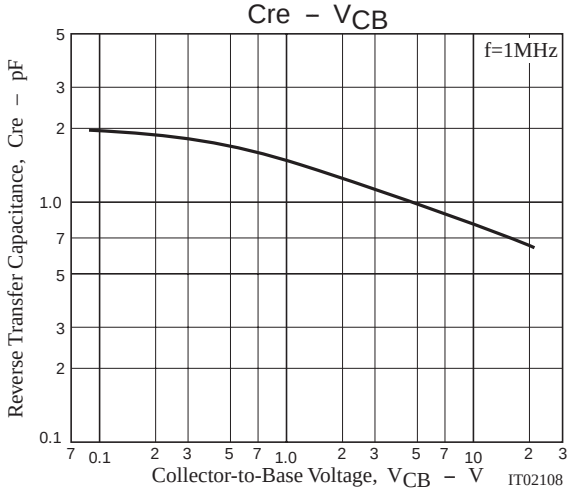
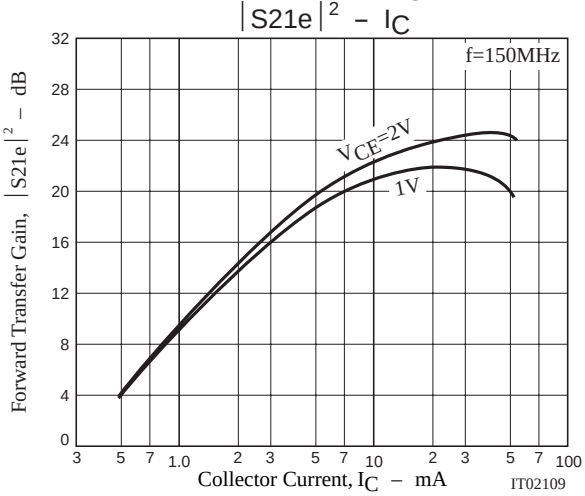
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

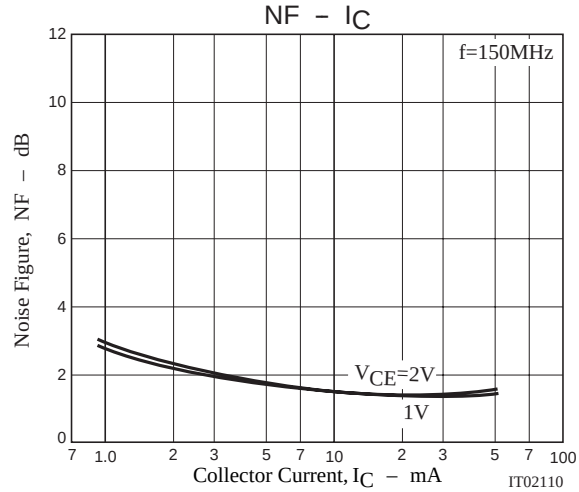

hFE – IC
DC Current Gain, hFE
VCE=2V
1V
Collector Current, IC – mA
IT02105

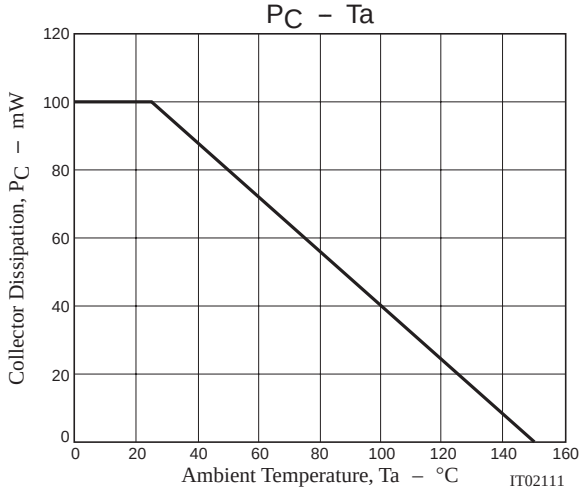

fT – IC
Gain-Bandwidth Product, fT – GHz
VCE=2V
1V
Collector Current, IC – mA
IT02106


Cob – VCB
f=1MHz
Output Capacitance, Cob – pF
Collector-to-Base Voltage, VCB – V
IT02107


Cre – VCB
f=1MHz
Reverse Transfer Capacitance, Cre – pF
Collector-to-Base Voltage, VCB – V
IT02108

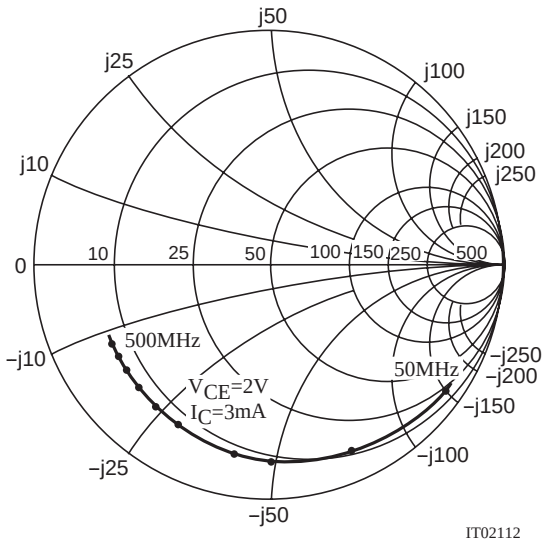

|S21e|2 – IC
f=150MHz
VCE=2V
1V
Forward Transfer Gain, |S21e|2 – dB
Collector Current, IC – mA
IT02109


NF – IC
f=150MHz
VCE=2V
1V
Noise Figure, NF – dB
Collector Current, IC – mA
IT02110

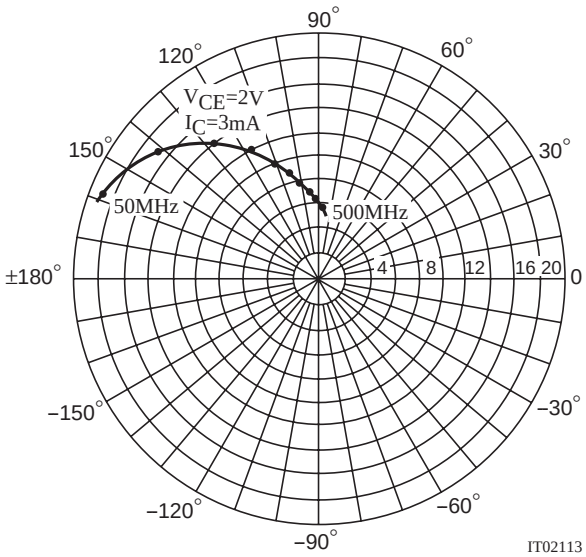

PC – Ta
Collector Dissipation, PC – mW
Ambient Temperature, Ta – °C
IT02111

S parameter [Tr1]

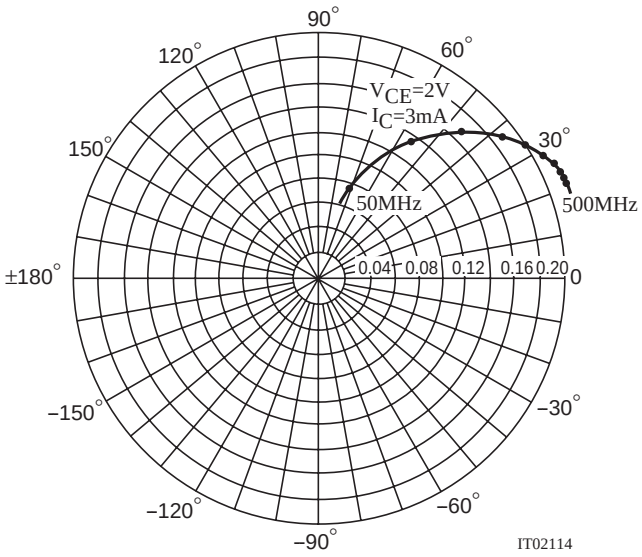
S11e
f=50 to 500MHz(50MHz Step)



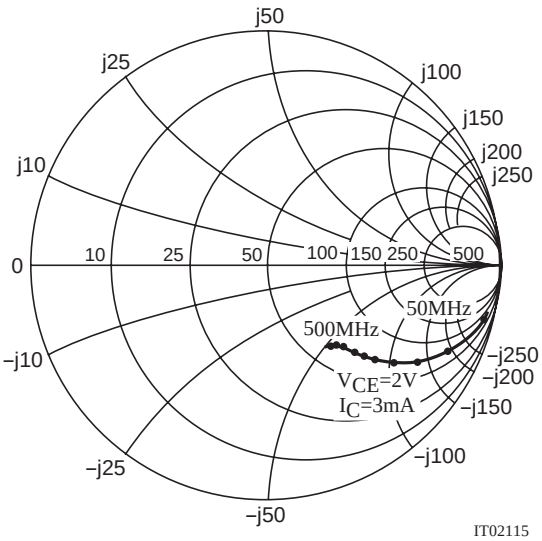
S21e
f=50 to 500MHz(50MHz Step)



S12e
f=50 to 500MHz(50MHz Step)



S22e
f=50 to 500MHz(50MHz Step)



S Parameters (Common emitter)

V_{CE}=2V, I_C=1mA, Z_O=50Ω

Freq (MHz)	$\lvert S_{11} \rvert$	$\angle S_{11}$	$\lvert S_{21} \rvert$	$\angle S_{21}$	$\lvert S_{12} \rvert$	$\angle S_{12}$	$\lvert S_{22} \rvert$	$\angle S_{22}$
50	0.965	–25.6	3.48	163.7	0.040	75.3	0.985	–7.1
100	0.948	–49.3	3.30	149.2	0.075	62.8	0.951	–13.3
150	0.922	–69.5	2.96	136.6	0.101	51.8	0.907	–18.0
200	0.903	–86.0	2.65	126.3	0.119	42.9	0.859	–21.7
250	0.885	–99.4	2.33	117.3	0.131	35.9	0.819	–24.6
300	0.873	–110.4	2.07	110.1	0.139	30.1	0.791	–26.9
350	0.866	–119.4	1.89	103.8	0.145	25.4	0.778	–28.7
400	0.854	–127.4	1.73	97.8	0.147	21.2	0.753	–30.8
450	0.846	–133.9	1.58	92.9	0.148	17.7	0.742	–32.7
500	0.847	–138.9	1.44	88.5	0.148	15.0	0.736	–34.4

V_{CE}=2V, I_C=3mA, Z_O=50Ω

Freq (MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
50	0.909	–35.9	9.43	158.4	0.038	71.0	0.949	–14.8
100	0.873	–66.2	8.30	141.0	0.067	56.0	0.849	–26.1
150	0.836	–89.8	7.03	127.6	0.084	44.9	0.744	–33.4
200	0.815	–106.3	5.94	117.9	0.095	37.5	0.658	–38.0
250	0.794	–119.1	5.05	110.4	0.100	32.4	0.590	–41.4
300	0.784	–128.7	4.36	104.3	0.104	28.7	0.550	–43.2
350	0.779	–136.3	3.90	99.4	0.107	26.0	0.518	–44.7
400	0.769	–143.1	3.46	94.8	0.108	23.9	0.493	–45.8
450	0.767	–148.1	3.13	91.3	0.108	22.4	0.474	–47.2
500	0.766	–152.1	2.83	87.8	0.108	21.7	0.463	–48.5

V_{CE}=2V, I_C=10mA, Z_O=50Ω

Freq (MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
50	0.775	–61.9	23.54	145.3	0.033	61.4	0.836	–34.4
100	0.731	–101.2	17.31	124.8	0.048	46.5	0.624	–55.2
150	0.709	–124.3	13.06	112.7	0.056	39.6	0.481	–67.0
200	0.704	–136.7	10.22	105.5	0.060	37.1	0.387	–75.8
250	0.695	–146.3	8.43	100.2	0.064	36.5	0.335	–80.4
300	0.695	–152.6	7.09	96.2	0.066	36.8	0.296	–85.3
350	0.695	–157.6	6.21	92.7	0.070	37.2	0.270	–87.4
400	0.694	–162.0	5.45	89.8	0.072	38.5	0.245	–91.4
450	0.696	–164.9	4.84	87.5	0.075	39.9	0.231	–95.3
500	0.694	–167.7	4.39	85.0	0.078	41.5	0.222	–97.9

V_{CE}=2V, I_C=30mA, Z_O=50Ω

Freq (MHz)	$\|S_{11}\|$	$\angle S_{11}$	$\|S_{21}\|$	$\angle S_{21}$	$\|S_{12}\|$	$\angle S_{12}$	$\|S_{22}\|$	$\angle S_{22}$
50	0.647	–98.6	37.50	129.9	0.024	52.4	0.665	–61.6
100	0.657	–134.1	22.96	111.5	0.032	44.8	0.448	–90.7
150	0.663	–149.5	16.09	103.0	0.037	44.8	0.353	–107.8
200	0.665	–157.6	12.33	97.8	0.041	47.3	0.308	–119.8
250	0.664	–163.2	9.95	94.3	0.046	49.5	0.286	–128.1
300	0.667	–167.3	8.35	91.3	0.051	52.2	0.271	–133.9
350	0.669	–170.2	7.23	89.0	0.055	54.0	0.258	–138.9
400	0.672	–173.0	6.33	86.9	0.060	55.9	0.253	–143.4
450	0.670	–174.9	5.64	85.1	0.066	57.2	0.251	–146.5
500	0.671	–176.6	5.08	83.3	0.071	58.3	0.250	–148.4